

REVISION OF THE NEARCTIC SPECIES OF *HYSSOPUS* GIRAULT (HYMENOPTERA: EULOPHIDAE)

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Abstract.—The Nearctic species of *Hyssopus* Girault (Hymenoptera: Eulophidae) are revised for the first time. Eight species are included and lectotypes are designated for *novus* Girault and *benefactor* (Crawford). A key to the species is presented. Two new taxa (*clypealis*, and *aaba*) are described and illustrated and several new host records are listed. All species of *Hyssopus* are primary parasites of lepidopterous larvae that mine or bore in twigs, cones, and stems.

Girault (1916) proposed the generic name *Hyssopus* for a single species, *thymus*. Since that time, several other species have been described from North America by other authors (e.g., Gahan, 1927), and other species have been transferred to *Hyssopus* from related genera. However, the included species have never been revised, and there has been considerable difference of opinion over the limits of the genus. Boucek (1965) stated that the species were at best a subgenus of *Elachertus*. Askew (1964) also recognized that these species formed a distinct group but kept them in *Elachertus*. More recently, authors (e.g., Burks, 1979; Graham, 1983; Boucek, pers. comm.) have treated *Hyssopus* as a valid genus separate from *Elachertus*.

The species of this genus are all primary parasites of the larvae of Lepidoptera that mine or bore in the stems, twigs, or cones of various trees and shrubs. Some of these are major pests of forest trees (e.g., *Rhyacionia frustrana* (Comstock), the Nantucket Pine Tip Moth) or ornamentals (e.g., *Synanthedon scitula* (Harr.), the Dogwood Borer).

All types, including new species, are deposited in the U.S. National Museum of Natural History. Many of the older types are in poor shape, having been poorly mounted originally or subsequently mishandled. The heads of most of the species were removed by Girault and mounted on slides. Unfortunately, several of them were smashed, and the fragments make it extremely difficult or impossible to see certain features of the ocelli, vertex, and so on. This problem has been circumvented in some species by the naming of intact specimens from the syntype series as lectotype. However, in those cases where a holotype was designated or only a single specimen was described, this has not been possible, and the inability to see certain features on the head of these specimens has been a problem during the course of this study.

Names of hosts follow Hodges et al. (1983). Common names of hosts are from Werner (1982). New host and locality records established during the course of this study are marked by “*.” Nomenclature for sculpturing follows Harris (1979). Head height, width, and eye height is measured in frontal view and at the widest point. Eye width is measured in lateral view. All measurements and ratios were taken with

an eyepiece reticle. Abbreviations for museums are given in the acknowledgments. The key to species will work for both males and females, there being little in the way of sexual dimorphism in this genus.

KEY TO SPECIES

1. Head in front view as high or higher than wide (Figs. 1, 2); gaster covered posteriorly and laterally with imbricate sculpturing (Fig. 11); median propodeal carina weakly expressed, barely raised from the surface, and occasionally nearly absent (Fig. 6); hindfemora swollen medially, less than $3\times$ as long as wide 2
- Head in front view wider than high (Figs. 3, 4); gaster smooth; median propodeal carina strongly expressed, complete and raised from the surface (Figs. 7, 8); hindfemora cylindrical, more than $3\times$ as long as wide 4
2. Head in front view as high as wide (Fig. 1); eye height less than $\frac{1}{2}$ head height; scutellum about as long as wide; hindfemora about $2\times$ as long as wide *rhyacioniae* Gahan
- Head in front view higher than wide; eye height more than $\frac{1}{2}$ head height (Fig. 2); scutellum longer than wide; hindfemora about $3\times$ as long as wide *novus* Girault
3. Vertex covered by erect black setae; eyes with numerous silvery setae (Fig. 4); side lobes of scutum with 2 enlarged setae at medial margin (Fig. 10); uncus with 5 sensillae (Fig. 17) *aaba*, new species
- Vertex covered by small, usually silver or white setae; eyes bare or with few scattered and inconspicuous setae (Fig. 2); side lobes of scutum with single large seta at medial margin; uncus with 4 sensillae 5
4. Clypeus produced forward from margin of oral cavity (Fig. 14); mandibles and all coxae yellow *clypealis*, new species
- Clypeus not produced forward from margin of oral cavity (Fig. 15); at least one pair of coxae or mandibles brown or black 6
5. Scutellum and axillae smooth (Fig. 9); dorsum usually flat, metanotum and propodeum on about same plane as scutellum *johannseni* (Crawford)
- Scutellum and axillae covered by light alutaceous sculpture (Fig. 7); dorsum usually inclined, metanotum and propodeum sloping away from plane of scutellum 7
6. Hind margin of compound eye in dorsal view reaching posterior margin of head (Fig. 18); mandibles with five teeth *benefactor* (Crawford)
- Hind margin of compound eye in dorsal view not reaching posterior margin of head (Fig. 19); mandibles with 6 teeth (Fig. 16) 8
7. Propodeal carina flaired and raised anteriorly (Fig. 8); metanotum barely expanded medially, petiole as long as wide *sanninoideae* (Girault)
- Propodeal carina not raised anteriorly (Fig. 7); metanotum distinctly triangular, petiole wider than long *thymus* Girault

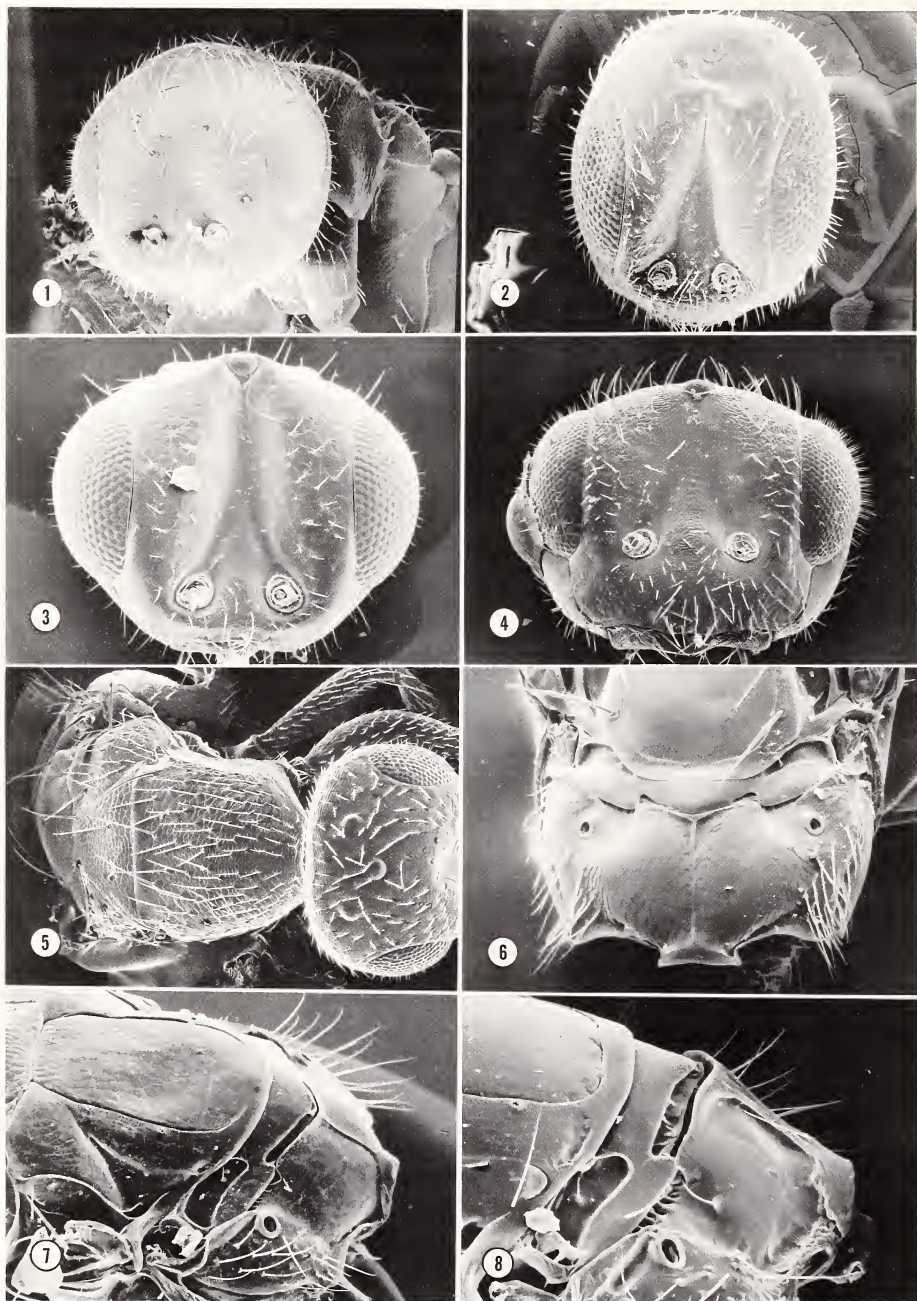
Genus *Hyssopus* Girault

Hyssopus Girault, 1916:115. Type species: *Hyssopus thymus* Girault. Monotypic.

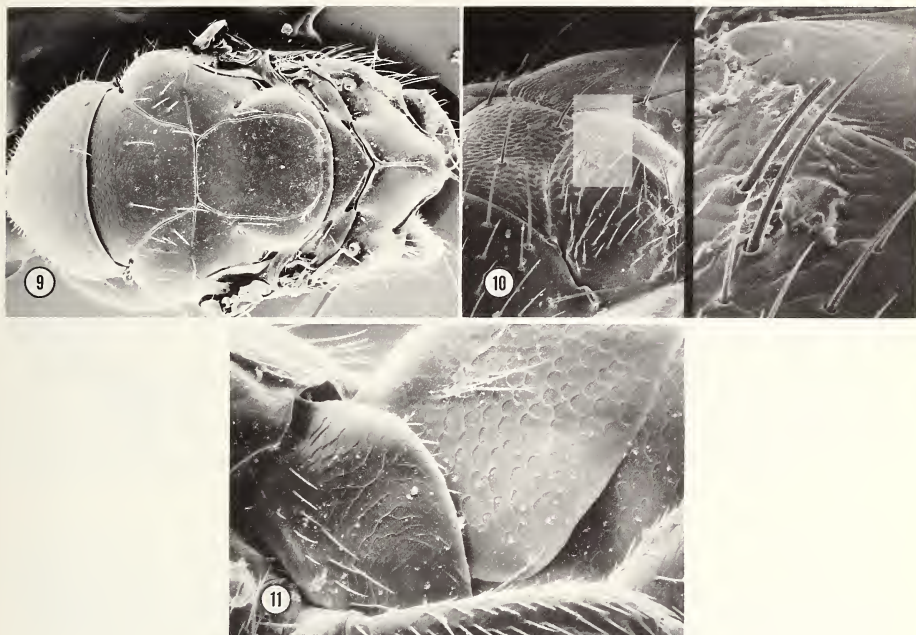
Hyssopiscus Ghesquière, 1946:370. Unnec. new name.

Crataepoides Masi, in Zinna 1955:66. Type species: *Crataepoides russoi* Zinna. Orig. desig.

Diagnosis. Postmarginal and stigmal veins well developed; funicle 4-segmented, club 2-segmented (Figs. 12, 13); scutellum with a pair of parallel lateral grooves curving inwards posteriorly (Figs. 6, 9); pronotum as long as wide, about as wide as scutum (Fig. 5), sloping gradually toward the foramen, and not abruptly narrowed



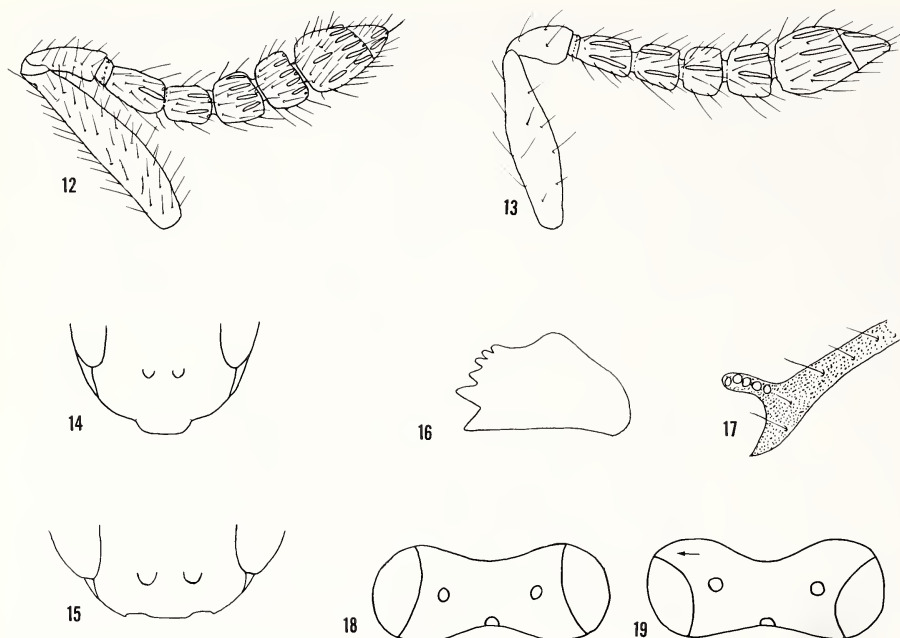
Figs. 1-8. 1-4. Heads of *Hyssopus* spp. 1. *H. rhyacioniae*. 2. *H. novus*. 3. *H. thymus*. 4. *H. aaba*. 5. Dorsal pronotum and head of *H. rhyacioniae*. 6. Propodeum of *H. novus*. 7. Scutellum and propodeum of *H. thymus*. 8. Lateral propodeum of *H. sanninoideae*.



Figs. 9–11. Dorsal thorax of *H. johannseni*. 10. Lateral scutum of *H. aaba*. 11. Hindcoxa and lateral gaster of *H. novus*.

anteriorly; covered with coriaceous sculpturing; mid lobe of scutum with four setae (Fig. 9), notauli meeting scutellum near inner angles of axillae; body generally black or dark reddish brown.

Discussion. This genus is very closely related to *Elachertus* Spinola, as mentioned above. Unfortunately, *Elachertus* is also in need of revision, and the limits of that genus have not been rigorously defined. The North American species of *Elachertus* do share a similar habitus, but until those species have been revised it remains a possibility that the characters used to distinguish the group are plesiomorphic. Nevertheless, for the purposes of character polarity, *Elachertus* as currently defined is the most likely sister taxon of *Hyssopus*. From my study of *Elachertus* and related genera, I believe that *Hyssopus* can be defined by the following shared derived states: pronotum in dorsal view about as long as wide or longer, sloping gradually toward the foramen, about as wide as the scutum, and not narrowed anteriorly; midlobe of scutum with only four setae. In related groups, the pronotum in dorsal view is usually distinctly wider than long, narrows anteriorly, and slopes abruptly, sometimes almost vertically, towards the foramen. The possession of four scutal setae is more problematic, since it occurs in other more distantly related genera. However, in *Elachertus* and other closely related genera the scutum is generally covered by at least 6 setae and occasionally many more. Therefore, I believe that the condition seen in species of *Hyssopus* is synapomorphic for that group.



Figs. 12–19. 12, 13. Antennae. 12. *H. aaba*. 13. *H. clypealis*. 14, 15. Frontal views of head. 14. *H. clypealis*. 15. *H. sanninoideae*. 16. Mandible of *H. thymus*. 17. Stigmal vein and uncus of *H. aaba*. 18, 19. Dorsal view of heads. 18. *H. benefactor*. 19. *H. thymus*.

Hyssopus novus Girault

Hyssopus novus Girault, 1917b:3.

Diagnosis. Femora swollen medially, less than $3\times$ as long as wide; head in front view higher than wide; eye height more than $\frac{1}{2}$ head height (Fig. 2); gaster covered posteriorly and laterally by imbricate sculpturing (Fig. 11); scutellum longer than wide; median propodeal carina weak (Fig. 6); hindtibia dark brown or black.

This species is most closely related to *rhyacioniae*. It can be separated by the following: head as high as wide (higher than wide in *rhyacioniae*), eye height more than $\frac{1}{2}$ head height (less than $\frac{1}{2}$ head height in *rhyacioniae*), and the scutellum as long as wide (longer than wide in *rhyacioniae*).

Hosts. Pyralidae: *Dioryctria ponderosae* (Dyar)*, *D. auranticella* (Grote)*; *D. cambiicola* Dyar*. Tortricidae: *Rhyacionia neomexicana* (Dyar)*.

Distribution. Calif., Idaho*, N.M.*, Ariz.*, Colo.*

Types. Girault did not specify how many specimens he saw when he described this species, but the USNM type records indicate that there were only two. The lectotype female (present designation) is point mounted with the following data: Hopkins U.S. no. 14265, reared, *Pinus attenuata*, parasite of *Dioryctria xanthaenobares*, Patricks creek, California, J. M. Miller collector, Sept. 15, 1916. USNM type no. 21376. Paralectotype female with same data.

The lectotype is nearly intact, except for the antennae (lower right coverslip) which were mounted on the same slide as the head, antennae, and parts of the legs of the paralectotype. This slide is labelled with the species name and the type number in Girault's hand. The paralectotype is also missing its pronotum and one set of wings.

Other specimens examined. 39 females and 2 males (USNM).

Variation. Size ranges from 1.6 to 1.8 mm. Color is generally dark reddish brown to black. The scape, flagellum, and legs vary from light brown or yellowish to black, usually with the distal tips of the femora and tibiae lighter than the rest of the leg. The base of the gaster on some specimens is distinctly lighter in color than the rest of the gaster. Sculpturing of the scutellum and area laterad of the median propodeal carina varies from nearly smooth to distinctly alutaceous. The median propodeal carina is generally complete in this species, but is slightly more weakly expressed in some specimens. The eyes of some specimens appear to be distinctly setose, as mentioned by Gahan in his description of *rhyacioniae*. However, I do not find that it is a reliable difference, since some of the specimens of *novus* have eyes whose setation appears nearly indistinguishable from those of *rhyacioniae*.

Hyssopus rhyacioniae Gahan

Hyssopus rhyacioniae Gahan, 1927:546.

Diagnosis. Femora swollen medially, less than $3\times$ as long as wide; head in front view as wide as high; eye height less than $\frac{1}{2}$ head height (Fig. 1); scutellum about as long as wide; gaster covered posteriorly and laterally by imbricate sculpturing (Fig. 11); hindfemora about $2\times$ as long as wide; hindtibiae light brown or yellow.

This species is most closely related to *novus* Girault. It may be separated by the following: head as high as wide (higher than wide in *novus*), eye height less than $\frac{1}{2}$ head height (more than $\frac{1}{2}$ head height in *novus*) and scutellum as long as wide (longer than wide in *novus*).

Hosts. Pyralidae: *Dioryctria abietivorella* (Grote), *D. amatella* (Hulst) (Southern Pine Coneworm), *D. cambiicola* (Dyar), *D. zimmermani* (Grote) (Zimmerman Pine Moth). Tortricidae: *Rhyacionia frustrana* (Comstock) (Nantucket Pine Tip Moth). Sesiidae: *Synanthedon pini* (Kellicott)*. The original label on this series of specimens indicates that the series was reared from *Parharmonia pini*. *Parharmonia* is now considered a synonym of *Albuna* Henry Edwards. Unfortunately, there is no species *pini* currently assigned to that genus. The closely related genus *Synanthedon* Hubner (from which other species of *Hyssopus* have been reared) does contain a species *pini* (Kellicott) and it is likely that this is the species referred to by the label (D. Weissman, pers. comm.).

Distribution. N.Y., Virg., Md., S.C., Ga., Miss., Ark., La., Fla., Ill., Ind., Wisc., Ohio, Tex., and Ontario. Since Burks' summary of distribution did not list individual states, it is not possible to say if some of the state records listed above may be new.

Types. Holotype female on point with data: Virginia, E. Falls Church. 6-25-1916. R. A. Cushman collector. Ex. *Rhyacionia frustrana* (Comst). USNM type no. 40179. Two male and 15 female paratypes with same data as holotype, except dates range from 6-25 to 7-11.

Other specimens examined. 12 females and 1 male (CNC), 80 females and 2 males (USNM).

Variation. Length varies from 1.3 to 1.8 mm. Body color ranges from reddish brown to black. The scape, pedicel, parts of the funicle, femora, and tibiae vary in color from light brown or yellowish to black. The base of the gaster is occasionally somewhat lighter in color than the rest of the gaster. The median propodeal carina is nearly absent in some specimens. The paratype males (reared from *Rhyacionia*) are quite similar to the females. However, three male specimens (two of which were reared from *Dioryctria amatella* along with females of this species) are quite different when compared to the males from the type species. The males from *Dioryctria* have an enlarged head ($1\frac{3}{4}$ to $2\times$ as wide as the pronotum), reduced eyes, increased numbers of setae on the frons and vertex, the scape is swollen apically, the mandibles are enlarged, and the femora are broader than in normal males and females. I believe that this morphological difference may be related to host, but additional rearings would be needed for a definitive answer. A single series of three specimens reared from *Synanthedon pini* (see above) have the teeth of the mandibles blunted.

Hyssopus thymus Girault

Hyssopus thymus Girault, 1916:115.

Diagnosis. Head in front view wider than high; gaster smooth; hindfemora cylindrical, more than $3\times$ as long as wide; propodeal carina complete, well developed (Fig. 7); scutellum and axillae alutaceous; head in dorsal view with compound eye not reaching posterior margin of occiput (Fig. 19); mandibles with 6 teeth.

This species is most closely related to *sanninoideae* (Girault) and *benefactor* (Crawford), all of which have the scutellum covered by light alutaceous sculpturing. However, *sanninoideae* has the median propodeal carina distinctly raised and flaired anteriorly (carina only slightly raised and not flaired anteriorly in *thymus*) and the petiole is as long as wide (petiole a narrow band, not longer than wide in *thymus*) and *benefactor* has the posterior margin of the compound eyes contiguous with the hind margin of the head (Fig. 18) (posterior margin of eyes not reaching back of head in *thymus*, Fig. 19) and the mandibles with 5 teeth (mandibles with 6 teeth in *thymus*). It is also very similar to *johannseni* (see discussion under that species) but can be separated by the sculpturing of the scutellum (smooth in *johannseni* and alutaceous in *thymus*).

Hosts. Pyralidae: *Dioryctria auranticella* (Grote), *D. zimmermani* (Grote) (Zimmerman Pine Moth). Tortricidae: *Petrova comstockiana* (Fern.) (Pitch Twig Moth), *P. wenzeli* (Kft.), *Rhyacionia buoliana* (D. & S.) (European Pine Shoot Moth), *R. frustrana* (Comstock) (Nantucket Pine Tip Moth), *R. rigidana* (Fern.) (Pitch Pine Tip Moth), *Endothenia albolineana* (Kft.)* (Spruce Needleminer). Gracillariidae: *Marmara* sp.* Gelechiidae: *Metzneria lappella* (L.)*. Coleophoridae: *Coleophora cratipennella* (Clem.)*, *C. concolorella* (Clem.)*.

Distribution. N.H.*, Vt.*, N.Y., Conn., Ohio, Virg., Mich., Ill., Wisc., N.D., Calif., Tex., Fla., Ontario, Sask.*, Que.* Peck (1963) also cites a record from Nebraska.

Types. Holotype female on point with data: Nebraska, Lincoln. G. I. Rewes collector. Webster no. 2142. USNM type no. 19922. Girault mounted the head, antennae, one forewing, and two legs of the type. This slide is labelled with the species name and the above type no. The head is badly crushed and the antennae are disarticulated. The other wings have apparently been lost.

Other specimens examined. 118 females, 17 males (CNC); 2 males, 1 female (SWE); 49 females, 2 males (DCD); 151 females, 14 males (USNM), 1 female (INHS).

Variation. Length varies from 1.0 to 2.5 mm. Body color is generally black, with some smaller specimens tending to be light brown or reddish. The coxae are almost always black except in smaller specimens in which they may be brownish yellow. Likewise, the femora and occasionally the tibiae and tarsi are black or dark brown but may become lighter colored in smaller specimens. In critical point dried specimens, the gaster is usually light brown with the base slightly lighter colored than the rest and the ovipositor sheaths may reach slightly past the tip. Air dried specimens, in which the gaster has collapsed generally do not have the ovipositor sheaths reaching much past the tip of the gaster. The scutellum sculpturing varies from distinctly alutaceous to nearly smooth, but there is always at least some sculpturing anteriorly.

Hyssopus johannseni (Crawford)

Elachertus johannseni Crawford, 1912:181.

Elachistus evetriae Girault, 1917a:1. New **Synonymy.**

Diagnosis. Head in front view wider than high; gaster smooth; hindfemora cylindrical, more than $3 \times$ as long as wide; propodeal carina complete, well developed (as in Fig. 7); scutellum and axillae smooth; metanotum and propodeum on about same plane as scutellum.

This species is closely related to *sanninoideae* and *thymus* from which it differs mainly in having the scutellum and axillae smooth (scutellum and axillae sculptured in other species). In addition, the dorsum of the thorax is generally quite flattened in specimens of *johannseni*, with the scutellum, metanotum and propodeum all on the same plane. In the other species the metanotum and propodeum slope to some extent away from the plane of the scutellum.

Hosts. Tortricidae: *Barbara colfaxiana taxifoliella* (Busck.); *Mellisopus latifer-reanus* (Wlsm.); *Petrova albicapitana* (Busck.) (Northern Pitch Twig Moth); *P. wenzeli* (Kearf.); *Cydia* sp. (previously *Laspeyresia* sp.); ? *Endothenia montanana* Kearf.* (see following). A series of specimens from Manitoba (loaned from CNC) bears the host name "*Thiodia montanata* Kearf." However, I can find no reference to such a combination. There is, however, a species *Endothenia montanana* Kearfott, which is almost certainly the species referred to on the label of these specimens.

Distribution. Maine, Virg., Miss., Colo.*, Utah*, Ore., Alberta*, Manitoba*. Burks (1979) also lists Minnesota and Idaho as localities for this species, records which he probably established from his identification work. In addition, Peck (1963) cites a record from Ohio. However, I have not seen specimens from these areas and cannot confirm them.

Types. Holotype female of *johannseni* on point with data: Orono, Maine. July, 1911. Maine experiment station Lot 1386, sub 5. USNM type no. 14595. Head, antenna, and parts of legs on slide. The type specimen is in very poor shape. Girault slide mounted the head, antennae, and parts of the legs and the head is badly crushed. The remainder of the specimen was apparently originally mounted on a minuten pushed through the gaster. The gaster remains on the minuten, but the thorax is now attached in a large spot of glue to the surface of the block holding the minuten and much of the thorax is obscured.

Although Girault did not specify how many specimens he saw when he described *evetriae*, there are 3 specimens labelled as types in the USNM collection and the type records indicate that there were only 3 specimens in the original series. The types of *evetriae* are largely intact, except for one specimen which has the head slide mounted and crushed.

Other specimens examined. 109 females, 17 males (USNM); 46 females, 15 males (CNC).

Variation. Size varies from 1.6 to 2.5 mm. Color of the legs varies somewhat, with the femora and particularly the tibiae fading from black to brown or yellowish in some specimens. The base of the gaster in some males is brownish. The scutellum and axillae are usually slightly advanced beyond the posterior margin of the scutum, but in a few specimens they end in a straight line with it. The scutellum is generally distinctly longer than wide, but in a few smaller specimens it becomes somewhat expanded laterally and nearly as wide as long. Finally, some specimens have the sculpturing of the scutum and posterior margin of the pronotum faded from the normal alutaceous to nearly smooth.

Discussion. *H. evertriae* was described by Girault from material collected in Oregon, and *johannseni* was described from material collected in Maine. Although the two species were kept separate by later authors largely on the basis of their distribution, specimens are now available from intermediate localities. I find no morphological differences to indicate that they are not the same species and propose the above new synonymy. A similar problem exists between this species and *thymus* Girault. There is a distinct difference between the types and the majority of the reared series of the two species as indicated by the differences presented in the key and diagnoses. However, after studying several series of specimens there appear to be some specimens that are intermediate between the two different morphological types. In addition, the ranges of the two species overlap, and the hosts are similar although not identical. Finally, the scapes of the males of both species tend to be somewhat swollen medially. Nonetheless, at this time, the amount of material is limited, and I am reluctant to synonymize the two species without additional reared specimens.

Hyssopus benefactor (Crawford)

Elachistus benefactor Crawford, 1912:182.

Diagnosis. Head in front view wider than high (as in Fig. 3); gaster smooth; hind-femora cylindrical, more than $3\times$ as long as wide; propodeal carina complete, well developed (as in Fig. 7); scutellum and axillae alutaceous; compound eye in dorsal view with hind margin reaching hind margin of occiput (Fig. 18); mandibles with 5 teeth.

This species is closely related to *thymus*. It can be separated by the eye character given above, and by the difference in the mandibles (5 teeth in *benefactor* and 6 in *thymus*).

Hosts. Tortricidae: *Petrove albicapitana* (Bsk.) (Northern Pitch Twig Moth), *P. comstockiana* (Fern.) (Pitch Twig Moth), *P. metallica* (Bsk.), *P. wenzeli* (Kft.). Cosmopterigidae: *Limnaecia phragmitella* Staint*.

Distribution. Wash. D.C., N.Y., Minn., Utah*, Quebec*, Ontario*. Burks (1979)

also cites Maryland, Ohio and British Columbia, and Peck (1963) lists Alberta or British Columbia which probably refers to the same record cited by Burks.

Types. This species was described from 3 syntypes, only two of which have survived. The lectotype (present designation) is point mounted with data: New York, Karner. ex. *Evetria comstockiana*. 26/VI/1901. N.Y.S. collection. USNM type no. 14809. Crawford indicated in his original description that the specimens had been reared by E. P. Felt. The head, antennae, and parts of the legs of the lectotype have been slide mounted, and labelled with the species name and the type number. The paralectotype female is also point mounted with the same data as the lectotype and has a forewing and hindwing slide mounted. Neither of these types is in good condition, having been poorly mounted originally and subsequently damaged further by Girault, who slide mounted and crushed the head of the lectotype. However, more of this specimen remains than of the paralectotype, particularly the antennae and legs.

Other specimens examined. 14 females, 1 male (CNC); 7 females, 1 male (USNM).

Variation. Size varies from 1.6 to 2.2 mm. Very little additional variation was observed in the specimens available for study. The color of the femora varied from entirely black to dark brown, and the tibiae from dark brown to yellow.

Hyssopus sanninoideae (Girault)

Elachistus sanninoideae Girault, 1917a:85.

Diagnosis. Head in front view wider than high; gaster smooth; hindfemora cylindrical, more than $3\times$ as long as wide; propodeal carina complete, well developed, raised and flaired anteriorly (Fig. 8); scutellum and axillae alutaceous; metanotum bandlike, not expanded; petiole as long as wide.

This species is most similar to *thymus* Girault, from which it can be separated by the raised and flaired propodeal carina (propodeal carina flatter and not flaired in *thymus*), narrower metanotum (metanotum expanded medially in *thymus*), and longer petiole (petiole not longer than wide in *thymus*).

Hosts. Sessiidae: *Synanthedon exitiosa* (Say) (Peachtree Borer); *S. scitula* (Harr.) (Dogwood Borer); *S. pictipes* (G. & R.)* (Lesser Peachtree Borer).

Distribution. Ark., Ga.*, Virg., N.C.* Both Burks (1979) and Peck (1963) list records from Connecticut.

Types. Lectotype female (present designation) on point with data: Arkansas, Fayetteville. July 23, 1916. ex. *Sanninoidea exitiosa*. USNM type no. 20758. Girault cites B. Becker as collector in his original description. 3 female paralectotypes and 1 male paralectotype with same type numbers, but no other date. All five specimens cited by Girault as types have survived and are in relatively good shape. The lectotype is intact, and I have slide mounted the one antenna and labelled it with the same data as the rest of the type.

Other specimens examined. 67 females, 7 males (USNM).

Variation. Size ranges from 1.8 to 2.0 mm. Body color is generally black, except for the following: the head occasionally is reddish brown; the scape and funicle range from yellow to light brown; the coxae from brown to black; the femora and tibiae from yellow to brown, usually with the tips lighter; the gaster is usually dark brown,

with the anterior $\frac{1}{4}$ slightly lighter, especially in the males. The sculpture of the scutellum and scutum varies slightly, fading in some specimens to nearly smooth medially and posteriorly. The metanotum in some specimens is very narrow medially, and the foveae along the ventral edge may be quite pronounced in some specimens but quite small in others. The nucha may be smooth or slightly rugose. The degree to which the propodeal carina is raised and flaired anteriorly varies slightly but is always quite distinct.

Hyssopus clypealis, new species

Holotype female. Length 1.5 mm. Color as follows: head, and thorax black; scape, legs yellow; flagellum, gaster brown. Head in frontal view slightly wider than high (45:38); ocelli arranged in isosceles triangle, POL $2 \times$ OOL; eye height slightly more than $\frac{1}{2}$ head height; width of eye in lateral view $\frac{2}{3}$ as wide as head (16:24), surface apparently asetose; frons and vertex lightly alutaceous, becoming coriaceous below toruli; genae nearly smooth, very lightly alutaceous; clypeus produced forward and overhanging oral cavity (Fig. 14); mandibles with 2 large teeth and 4 smaller teeth; area dorsad of oral cavity with scattered silvery setae; antennae as in Figure 13; scutum coriaceous, side lobes with single enlarged seta; scutellum, and axillae coriaceous; pronotum as long as wide; scutellum longer than wide (24:18); metanotum sloping away from scutellum; propodeum with complete median carina, area laterad of carina lightly striate to alutaceous; lateral spiracular area below plain of median propodeum; callus with numerous setae; prepectus smooth; mesepisternum alutaceous; mesepisternal-mesepimeral suture acutely angled, foveolate over entire length; mesepimeron smooth, suture incomplete; petiole barely as long as wide; gaster smooth, about as long as wide; ovipositor sheaths reaching slightly past tip; hindcoxae slightly longer than wide; femora cylindrical, not swollen medially, more than $3 \times$ as long as wide; submarginal vein with 8 setae; uncus with 4 sensillae.

Male. Unknown.

Diagnosis. Head in front view wider than high; gaster smooth; forefemora cylindrical, more than $3 \times$ as long as wide; propodeal carina complete, well developed (as in Fig. 7); scutellum coriaceous; clypeus produced forward over oral cavity (Fig. 14).

This species is closest to *thymus* Girault and *sanninoideae* (Girault). It is most easily separated by the clypeal character given above (clypeus margin straight, not produced over oral cavity in *thymus* and *sanninoideae*). In addition, the coxae and legs in *clypealis* are concolorous yellow whereas in the other species the coxae and femora or tibiae are almost always marked with some brown or black (some smaller specimens of *thymus* reared from *Coleophora* spp. have been seen with yellow legs and coxae).

Hosts. Unknown.

Distribution. Known only from the type locality: Iowa.

Types. Holotype female on point (single antenna and pair of forewings mounted on slide) with data: Iowa, Muscatine Co., Oct. 4, 1952. J. C. Schaffner. 2 female paratypes with same data as holotype.

Etymology. The specific epithet refers to the enlarged clypeus found in the females of this species.

***Hyssopus aaba*, new species**

Holotype female. Length 2.5 mm. Color black except tibiae and tarsi brown. Head in frontal view wider than high (32:27); ocelli arranged in isosceles triangle; POL $3.5 \times$ OOL; eye height $\frac{2}{3}$ head height; width of eye in lateral view more than $\frac{2}{3}$ head width (32:24), surface covered with erect white setae; frons, vertex, and genae alutaceous to coriaceous, except becoming smooth at scrobes; vertex with numerous erect black setae (Fig. 4); clypeal margin straight; mandibles with 2 large and 3 smaller teeth; area dorsad of oral cavity with numerous setae; antennae as in Figure 12; scutum coriaceous, side lobes with 2 enlarged erect setae near notauli (Fig. 10); scutellum coriaceous, axillae nearly smooth; pronotum slightly wider than long (50:40); scutellum longer than wide (40:27); metanotum sloping slightly; propodeum smooth with complete median carina; lateral spiracular area below plane of median area; callus with numerous silvery setae; prepectus very lightly alutaceous, becoming coriaceous ventrally; mesepisternum alutaceous; mesepisternal-mesepimeral suture angled, foveolate ventrally; mesepimeron nearly smooth, very lightly alutaceous, suture complete; petiole slightly wider than long; gaster smooth, longer than wide (65:35); ovipositor sheaths reaching slightly past tip; hindcoxae about as long as wide; submarginal vein with 14 setae, uncus with 5 sensillae (Fig. 17).

Male. Unknown.

Diagnosis. Head in frontal view wider than high; gaster smooth; hindfemora cylindrical, more than $3 \times$ as long as wide; median propodeal carina well developed, raised from surface (as in Fig. 7); gaster smooth; vertex with numerous erect black setae (Fig. 4); eyes with numerous silver setae; side lobes of scutum with 2 enlarged setae (Fig. 10); uncus with 5 sensillae (Fig. 17).

This species is most easily confused with *benefactor* (Crawford) and *thymus* Girault. It can be separated by the following: eyes distinctly covered with silvery setae (eyes nearly bare in other species); vertex with numerous erect black setae (vertex covered by shorter usually silver setae in other species); uncus with 5 sensillae (uncus 4 sensillae in other species); and side lobes of scutum with 2 enlarged setae near the notaular margin (other species have only a single large seta on the midlobe near the notauli).

Hosts. Sessiidae: *Synanthedon sequoiae* (Hy. Edw.) (Sequoia Pitch Moth).

Distribution. Known only from the type locality: California.

Types. Holotype female on point (antenna and forewing mounted on slide) with data: California, Los Gatos. Aug. 4, 1970. ex. *Vespimima sequoiae* on pine. Three female paratypes with same data as holotype.

Etymology. The specific epithet is an arbitrary combination of letters.

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